

1. **DESCRIPTION:** Students will compete in activities involving knowledge of direct current (DC) electrical circuits.

**A TEAM OF UP TO:** 2

**APPROXIMATE TIME:** 50 minutes

2. **EVENT PARAMETERS:**

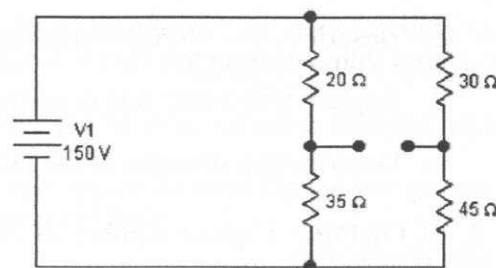
- a. Students are allowed to use any notes and/or calculators. Notes must be 3-hole punched and secured in a 3-ring binder of any size, so that regardless of orientation nothing falls out. Calculators must not have external probes or sensors of any type attached to them.
- b. The event supervisor must provide any needed measurement equipment such as multimeters or probes. Students may bring their own basic multimeters for use in place of event supervisor provided ones.

3. **THE COMPETITION:**

- a. The competition must consist of both hands-on tasks and questions related to DC electrical circuits. 50% of the score must be from the practical portion (hands-on tasks/applications), and 50% must be from the theoretical portion (written questions).
- b. Supervisors are encouraged to use measurement equipment (e.g., computer or calculator sensors/probes, multimeters, etc.) wherever possible or provide students with data sets collected by equipment following demonstration of the data collection. If used, data must be presented in a tabular and/or graphic format and students will be expected to interpret the data.
- c. The event supervisor may provide some mathematical relationships, but the students are expected to know and understand the concepts outlined below. The competition must consist of at least one task/question from each of the following areas:
  - i. DC circuits concepts, definitions and principles (e.g., voltage and current sources, EMF, resistance, applications of series and parallel circuits, voltage dividers, impedance matching)
  - ii. DC circuit analysis theory (e.g., Ohm's Law, parallel and series resistors, Kirchhoff's Laws, node and mesh analysis, Norton and Thevenin equivalents)
  - iii. DC circuit analysis practice (e.g., the use of voltmeters, ammeters, ohmmeters and multimeters, resistor color codes and their uses in series and parallel circuits, wheatstone bridges)
  - iv. Intermediate DC circuits concepts, definitions and principles (e.g., electrical SI base and derived units, capacitance, ideal diodes, electron current, RC circuits)
- d. Topics that must not be included in the competition are: semiconductors, AC circuit theory and devices, inductors.

4. **EXAMPLES OF CIRCUIT LAB STATIONS/ QUESTIONS:**

- a. The Event Supervisor provides a pre-assembled circuit consisting of resistors in parallel and/or series and one or more DC voltage sources. Students will be asked to determine electric potential difference between specified locations within the circuit, currents, resistance, and power dissipation in different parts of the circuit.
- b. Given the adjacent circuit diagram, students are asked to calculate the current, voltage and/or power in various labeled components.



5. **SCORING:**

- a. Points will be awarded for correct answers and/or proper technique.
- b. Ties will be broken using a designated task or question(s). The event supervisor will identify the tie breaker question(s) or task(s) on the answer form provided to the students at the beginning of the competition period. If more than one competition period is used, the tie breaker(s) will be the same for all periods.

**Recommended Resources:** All reference and training resources including the **Chem/Phy Sci CD** are available on the Official Science Olympiad Store or Website at <http://www.soinc.org>